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EXAMINER

FLEURANTIN, JEAN B

ART UNIT

PAPER NUMBER

2172

DATE MAILED: 12/23/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

AB

Office Action Summary

Application No.

09/420,509

Applicant(s)

FRANZ ET AL.

Examiner

Jean B Fleurant

Art Unit

2172

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on RCE 10/22/2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-88 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-88 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 10,13.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

Art Unit: 2172

DETAILED ACTION

1. Claims 1-88 are remained pending for examination.

Information Disclosure Statement

2. The references cited in the Information Disclosure Statement, PTO-1449, have been fully considered.

Response to Amendment

3. Applicant's arguments submitted on 10/22/2002 with respect to claims 1-88 have been fully considered but are not persuasive.

Response to Applicant' remarks

4. Applicant's response, page 22, argued that "Bahl fails to teach, suggest, or render obvious the present invention as claimed. Independent claims 1, 21, 41, 61 and 81 said relative entropy value being calculated relative to an entropy value of a root entry of said plurality of entries."

This argument is moot in view of the new ground(s) of rejection, see paragraph 5 below.

In response to applicant's argument on page 22, a prima facie case of obvious is established when the teachings from the prior art itself would appear to have suggested the claimed subject matter to a person of ordinary skill in the art. Once such a case is established, it is incumbent upon appellant to go forward with objective evidence of unobviousness. In re Fielder, 471 F.2d 640, 176 USPQ 300 (CCPA 1973).

Art Unit: 2172

In response to applicant's argument on pages 22 and 23, that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

Claim Rejections-35 U.S.C. § 103 (a)

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-88 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bahl et al. (U.S. Pat. No. 5,033,087) in view of Hargrave, III et al. (U.S. Pat. No. 6,131,082) ("Bahl") (submitted by the Applicant "Hargrave").

As per claims 1, 21, 41, and 61 Bahl substantially teaches a method for evaluating similarity among a plurality of data structures (thus, these tokens are analyzed to determine which word or words correspond to the sequence to the sequence of tokens, which is readable as evaluating similarity among a plurality of data structures) (see col. 1, lines 22-23), as claimed comprises analyzing each structure of said plurality of data structures to generate at least one

Art Unit: 2172

substructure (thus, decision graph defines phonological rules which describe variations in the pronunciation of the various language components due to the context in which the component occurs; which is readable as analyzing each structure of said plurality of data structures to generate at least one substructure) (see col. 2, lines 58-61); and

matching said at least one substructure to a database having a plurality of entries to obtain at least one matching entry (thus, after both the fast match operation and the detailed match operation the search processor 1020 invokes the language model 1010 to determine if the newly selected word fits in the context of the previously selected words, in addition to paring down the list of candidate words for application to the detailed match processor the language model 1010 distinguishes between the set of homophones provided as a result of the detailed match operation the language model used in the system shown in figure 8 is a three-gram language model or stated otherwise a language model having statistics on the likelihood of occurrence of groups of three consecutive words; which is readable as matching said at least one substructure to a database having a plurality of entries to obtain at least one matching entry) (see col. 7, lines 56-64). But Bahl does not explicitly indicate steps of generating a match value using a relative entropy value corresponding to said at least one matching entry and calculated relative to a root entry of said plurality entries. However, Hargrave indicates "... for each n-gram segment pair producing a segment n-gram weight tuple, this method simplifies the similarity calculations used below in the retriever module as well since the dot product of the vectors now 'with the normalized weights' produces the same results as the more computationally expensive cosine

Art Unit: 2172

measure, an example formula for normalizing the weights in the text segment vectors is: [see equation] where: Entropy.sub.i = entropy weight for a letter n-gram I from the global entropy calculation; freq.sub.ik = frequency of letter n-gram I in text segment k; and n = total number of unique letter n-grams, the normalized entropy calculation is performed in step 222 for each n-gram separately for each text segment in the source language file, this results in changing the weights such that any particular n-gram may have one weight in a first text segment with a different weight value for other text segments” (an entropy value can be calculated from a n-gram, which could be used as a root), (see col. 10, lines 29-62). Further, in columns 13 through 14, lines 60 through 5, Hargrave teaches as each n-gram is selected in turn the normalized entropy weight of the selected n-gram in the query vector is multiplied by the normalized entropy weight for the selected n-gram in each text segment in the aligned pair, it will be recalled that the normalized entropy weight for the selected n-gram in each text segment in the aligned pair is available from the posting vector, the result of this multiplication is added to the score associated with the text segment entry, as each n-gram in the query vector is processed the array accumulates a score which will be between 0.0 and 1.0 in the method of the preferred embodiment, representing the similarity between the query vector and each of the text segment vectors. Thus, it would have been obvious to a person of ordinary skill in the art at the time of the invention was made to modify the teachings of Bahl and Hargrave with steps of generating a match value using a relative entropy value corresponding to said at least one matching entry and calculated relative to a root entry of said plurality entries. This modification would allow the

Art Unit: 2172

teachings of Bahl and Hargrave to improve the performance of the system and method to match linguistic structures using thesaurus information, and provide an ability to fuzzy match words phrases as well as full sentences and multiple sentence documents (see col. 3, lines 41-43).

As per claims 2, 22, 42 and 62, Bahl substantially teaches a method according as claimed, further comprises creating said plurality of entries in said database (thus, the acoustic vectors produced from a relatively large set of acoustic inputs are generated and stored in the cluster element 1110; which is readable as creating said plurality of entries in said database) (see col. 5, lines 39-41);

processing said plurality of entries in said database (thus, language model 1010 is used to determine which word is correct from a group of homophones the language model 1010 used in this embodiment of the invention determines which word of a group is the most likely based on the preceding two words derived by the speech recognition system the words determined by this language model analysis are the output of the speech recognition system; which is readable as processing said plurality of entries in said database) (see col. 4, lines 61-68).

As per claims 3, 23, 43, 63 and 82, Bahl substantially teaches a method according as claimed, wherein said creating further comprises creating said plurality of entries using a tool having a graphical user interface and exporting said plurality of entries to said database (thus, language model 1010 is used to determine which word is correct from a group of homophones the language model 1010 used in this embodiment of the invention determines which word of a group is the most likely based on the preceding two words derived by the speech recognition

Art Unit: 2172

system the words determined by this language model analysis are the output of the speech recognition system; which is readable as creating said plurality of entries using a tool having a graphical user interface) (see col. 4, lines 61-68).

As per claims 4, 24, 44, 64 and 83, in addition to the discussion in claim 1, Bahl further teaches the step of wherein said processing further comprises verifying said plurality of entries for validity (thus, if each of these stored vectors is considered to be a point in a state-space defined by a state vector of possible acoustic features, then the set of all points produced by the training data may be grouped into clusters of points in the state-space, each point in a given cluster represents a one centisecond sample of a vocal sounds which is statistically similar to the sounds represented by the other points in the cluster, each of the clusters in the state space may be thought of as a being representative samples of a probability distribution each of these probability distributions which may for example be Gaussian distributions defines a prototype for a label; which is readable as verifying said plurality of entries for validity) (see col. 5, lines 39-54).

As per claims 5, 25, 45, 65 and 84, Bahl substantially teaches a method according as claimed, wherein said processing further comprises storing said each entry of said plurality of entries together with said corresponding relative entropy value in a compressed format (thus, the step 1804 generates a question of the form $x_{sub.i} \cdot \epsilon_{sub.i}$ which minimizes the conditional entropy of the generating data that is marked "false" and which produces a net reduction in the entropy of the checking data, the algorithm used in the step 1804 is described

Art Unit: 2172

below in reference to FIGS. 9A and 9B, if this question is "good" as determined, at step 1804, step 1806 causes it to be stored in the pylon at step 1810; which is readable as further comprises storing said each entry of said plurality of entries together with said corresponding relative entropy value in a compressed format) (see col. 15, lines 31-38).

As per claims 6, 26, 46, 66 and 85, Bahl substantially teaches a method according as claimed, further comprising extracting from a lexicon database having a plurality of elements each element associated to said each structure (thus, extracts all feneme sequences corresponding to individual phonemes in the training text these feneme sequences are grouped according to the phonemes they represent; which is readable as extracting from a lexicon database having a plurality of elements each element associated to said each structure) (see col. 9, lines 55-58), assigning at least one code of said each element to said each structure (thus, determines that the last leaf has been processed step 11016 is executed which stores all of the compound base forms in a table indexed to the leaves of the decision tree; which is readable as assigning at least one code of said each element to said each structure)(see col. 19, lines 50-56), and retrieving said at least one code during matching to obtain said at least one matching entry (thus, invokes the subroutine NEXT LEAF to select the first leaf in the tree. Step 11006 then collects all feneme sequences that belong to the selected leaf, these feneme sequences are clustered at step 11008 using the same algorithm described above in reference to figure 7, assuming that the data used to generate and check the decision tree includes approximately 3000 feneme sequences for each

Art Unit: 2172

phoneme; which is readable as retrieving said at least one code during matching to obtain said at least one matching entry) (see col. 19, lines 24-32).

As per claims 7, 27, 47 and 67, Bahl substantially teaches a method according as claimed, further comprising reading lexical probability files and assigning a probability value to said each element of said plurality of elements in said lexicon database (thus, each of the transitions tr1 and tr2 has a transition probability and a vector of 200 probability values representing the probability that any of the 200 fenemes may be produced during the transition, the transition tr8 is a null transition; which is readable reading lexical probability files and assigning a probability value to said each element of said plurality of elements in said lexicon database) (see cols. 6-7, lines 65-3).

As per claims 8, 17, 28, 37, 48, 57, 68, 77 and 86, Bahl substantially teaches a method according as claimed, wherein each structure of said plurality of data structures is a representation of a linguistic expression (thus, by analyzing a training text and corresponding vocalizations, can generate a set of phonological rules, these rules are applied to a speech recognition system in the embodiment described below, they may also be applied to a speech synthesis system to change the pronunciation of a word depending on its context, or they may simply be analyzed by linguists to increase their knowledge of this arcane art; which is readable as wherein each structure of said plurality of data structures is a representation of a linguistic expression)(see cols. 3-4, lines 63-2).

Art Unit: 2172

As per claims 9, 18, 29, 38, 49, 58, 69, 78 and 87, Bahl substantially teaches a method according as claimed, wherein said database is a thesaurus hierarchy including a root entry, said plurality of entries depending from said root entry (thus, these words are arranged in a tree structure for use by the processor 1006, so that words having common initial phonemes have common paths through the tree until they are differentiated; which is readable as wherein said database is a thesaurus hierarchy including a root entry, said plurality of entries depending from said root entry)(see col. 6, lines 33-37).

As per claims 10, 19, 30, 39, 50, 59, 70, 79 and 88, the limitations of claims 10, 19, 30, 39, 50, 59, 70, 79 and 88 are rejected in the analysis of claim 1, and these claims are rejected on that basis.

As per claims 11, 20, 31, 40, 51, 60, 71 and 80, Bahl substantially teaches a method according as claimed, wherein said each element in said lexicon database is a word (thus, each word in a dictionary is represented as a sequence of phonemes, which is readable as wherein said each element in said lexicon database is a word)(see col. 6, lines 23-25).

As per claims 12, 32, 52 and 72, in addition to the discussion in claim 1, Bahl further teaches steps of creating a plurality of entries in a database (thus, the acoustic vectors produced from a relatively large set of acoustic inputs are generated and stored in the cluster element 1110; which is readable as creating a plurality of entries in a database) (see col. 5, lines 39-41).

As per claims 13, 33, 53 and 73, Bahl substantially teaches a method according as claimed, further comprising storing said each entry of said plurality of entries together with said

Art Unit: 2172

corresponding relative entropy value in a compressed format (thus, the step 1804 generates a question of the form $x_{sub.i} \leq \epsilon_{sub.i}$ which minimizes the conditional entropy of the generating data that is marked "false" and which produces a net reduction in the entropy of the checking data, the algorithm used in the step 1804 is described below in reference to figures 9A and 9B, if this question is "good" as determined at step 1804, step 1806 causes it to be stored in the pylon at step 1810; which is readable as further comprises storing said each entry of said plurality of entries together with said corresponding relative entropy value in a compressed format)(see col. 15, lines 31-38).

As per claims 14, 34, 54 and 74, Bahl substantially teaches a method according as claimed, further comprises creating said plurality of entries using a tool having a graphical user interface (thus, determines which word of a group is the most likely based on the preceding two words derived by the speech recognition system the words determined by this language model analysis are the output of the speech recognition system; which is readable as creating said plurality of entries using a tool having a graphical user interface)(see col. 4, lines 61-68);

exporting said plurality of entries to said database (thus, by replacing the each of the 200 value label probability vectors associated with the various transitions in the word model by a single 200 value probability vector, each element in this vector is the largest corresponding value in all of the vectors used in the model; which is readable as exporting said plurality of entries to said database)(see col. 7, lines 48-53).

Art Unit: 2172

As per claims 15, 35, 55 and 75, in addition to the discussion in claims 1 and 12, Bahl further teaches analyzing each structure of said plurality of data structures to generate at least one substructure (thus, decision graph defines phonological rules which describe variations in the pronunciation of the various language components due to the context in which the component occurs; which is readable as analyzing each structure of said plurality of data structures to generate at least one substructure)(see col. 2, lines 58-61); and

matching said at least one substructure to a database having a plurality of entries to obtain at least one matching entry (thus, after both the fast match operation and the detailed match operation the search processor 1020 invokes the language model 1010 to determine if the newly selected word fits in the context of the previously selected words, in addition to paring down the list of candidate words for application to the detailed match processor the language model 1010 distinguishes between the set of homophones provided as a result of the detailed match operation the language model used in the system shown in figure 8 is a three-gram language model or stated otherwise a language model having statistics on the likelihood of occurrence of groups of three consecutive words; which is readable as matching said at least one substructure to a database having a plurality of entries to obtain at least one matching entry) (see col. 7, lines 56-64).

As per claims 16, 36, 56 and 76, in addition to the discussion in claim 6, Bahl further teaches verifying said plurality of entries for validity (thus, the feature selection element 1108 combines selected values of the vector signal SA to generate a vector AF of acoustic feature

Art Unit: 2172

signals; which is readable as verifying said plurality of entries for validity)(see col. 5, lines 30-32);

reading lexical probability files (thus, each transition has a probability associated with it and, in addition each of these transitions except the ones indicated by broken lines 'i.e. tr11, tr12, and tr13' has associated with it a vector of 200 probability values representing the probability that each of the respective 200 possible labels occurs at the transition, the broken-line transitions represent transitions from one state to another in which no label is produced; which is readable as reading lexical probability files) (see cols. 6-7, lines 63-3);

assigning a probability value to said each element of said plurality of elements in said lexicon database (thus, samples of a probability distribution each of these probability distributions which may, for example be assumed to be Gaussian distributions defines a prototype for a label or feneme, when the acoustic processor 1004 is in its training mode the cluster element provides the clusters to the prototype element which fits a Gaussian distribution to each cluster defining a prototype label which represents all points in the cluster, when the acoustic processor is in its labeling mode these prototypes are used by the labeller 1114 to assign labels to the feature vectors produced by the feature selection element 1108; which is readable as assigning a probability value to said each element of said plurality of elements in said lexicon database)(see col. 5, lines 50-62).

As per claim 81, in addition to the discussion in claim 1, Bahl further teaches a database having a plurality of entries (thus, the acoustic vectors produced from a relatively large set of

Art Unit: 2172

acoustic inputs are generated and stored in the cluster element 1110; which is readable as a database having a plurality of entries)(see col. 5, lines 39-41).

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Abdel-Mottaleb et al. US Patent Number 6,285,995 relates to the largest similarity to the query image. Horiguchi et al. US Patent Number 6,330,530 relates to the transformation of a source language linguistic.

Conclusion

7. Any inquiry concerning this communication from examiner should be directed to Jean Bolte Fleurantin at (703) 308-6718. The examiner can normally be reached on Monday through Friday from 7:30 A.M. to 6:00 P.M.

If any attempt to reach the examiner by telephone is unsuccessful, the examiner's supervisor, Mrs. KIM VU can be reached at (703) 305-8449. The FAX phone numbers for the Group 2100 Customer Service Center are: *After Final* (703) 746-7238, *Official* (703) 746-7239, and *Non-Official* (703) 746-7240. NOTE: Documents transmitted by facsimile will be entered as official documents on the file wrapper unless clearly marked "*DRAFT*".

Art Unit: 2172

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group 2100 Customer Service Center receptionist whose telephone numbers are (703) 306-5631, (703) 306-5632, (703) 306-5633.



Jean Bolte Fleurantin

December 11, 2002

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